

Correlation to Alabama Course of Study: Science
Foundations of Physical Science Student Text and Investigation Manual

Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
INQ.01 Science	Process and Application	Understand fundamental assumptions about the universe upon which the scientific enterprise is based.	58	Newton on a skateboard	6	asking questions and learning about natural world
			78	describe a problem that would be solved by an engineer	39	study energy transformations in daily life scenarios
			120	circuits in your house		
INQ.02 Science	Process and Application	Discuss science as a body of knowledge and an investigative process.	20	how will speed change?	6	asking questions and learning about natural world
			24	predicting speed from a graph	21	construct reasonable explanation based on data
			42	predict the speed of a car	35	study data and determine importance of height on speed of marble
					45	analyze data and explain a rule
					76	use data to predict best string length for a pendulum clock
					121	use graph to predict mass of six objects
					156	make predictions about solubility

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INQ.03 Science	Process and Application	Conduct scientific investigations systematically.	7	experimentation begins with a question	6	formulate hypothesis
			9	steps in the scientific method	6	predict which car will move fastest
			10	forming a hypothesis	6	how do we ask questions and get answers from nature?
			10	the research question and hypothesis	7	design your own experiment
			11	control and experimental variables	7	variables in an experiment
			12	writing lab procedures	7	perform your own experiment
			19	design your own experiment	7	compare results with hypothesis
			19	design your own experiment	7	doing a controlled experiment
			20	finding variability in data	7	test the effect of one other variable
			26	independent and dependent variables	9	devise a hypothesis
			28	identifying cause and effect relationships	9	design three experiments using car and ramp
			41	identify cause and effect	10	conduct car/ramp experiment
			42	devise an experiment	16	investigate Newton's 2nd law
			79	look at force data and decide the usefulness of a machine	16	decide how to vary the force on the car for this experiment

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				<p>18 use data to describe relationship between force and motion</p> <p>19 use data to infer correct relationship between variables</p> <p>21 determine effect of increasing mass</p> <p>21 construct reasonable explanation based on data</p> <p>21 choose independent and dependent variables for graph</p> <p>26 what variables can be changed?</p> <p>27 recognize variables</p> <p>27 think about the variables</p> <p>30 interpret block and tackle data</p> <p>34 formulate hypothesis</p> <p>34 where does the marble move the fastest?</p> <p>34 investigate motion on a rollercoaster</p> <p>35 study data and determine importance of height on speed of marble</p> <p>43 how did A and B tapes acquire different charge?</p>

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				45 analyze data and explain a rule
				75 design pendulum experiment
				75 investigate variables that affect the period of a pendulum
				75 plan three experiments to determine which variable affects the period of a pendulum
				75 perform self-designed experiment
				93 decision trees and the advantage of doing multiple trials
				141 build models of Na and Cl and use them to explain bonding
				151 explain how hypothesis compares to results
				151 perform the experiment you designed
				151 design experiment to find out if mass is conserved
				151 write a procedure
				157 add new rules to list based on findings
				166 which method will give fastest dissolving rate?

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				166 which factor will produce fastest dissolving rate? 166 devise hypothesis and explain 166 write a procedure 166 what three factors influence dissolving rate? 174 visit local water supply and perform testing 178 formulate hypothesis 198 which type of food contains the most energy? 198 formulate hypothesis
INQ.04 Science	Process and Application	Exhibit behaviors appropriate to the scientific enterprise consistently.	110 study appliance labels and instructions 142 create pamphlet on utility's energy saver programs 214 ultrasound technology 220 voice recognition technology 294 invention of Kevlar 434 study claims made by bottled water companies	76 analyze watch manufacturer's claims 146 record detailed observations 162 inferences from promotional materials for vehicles 173 study water filtration device claims

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INQ.05 Science	Process and Application	Demonstrate correct care and safe use of instruments, equipment, and chemicals.		20 safety tip for car/ramp setup 24 ropes and pulley safety 26 safety tip for hanging weights from lever 40 electrical safety 44 short circuit safety warning 56 short circuit safety warning 58 short circuit safety warning 146 safety in the lab 150 chemistry safety 158 wear goggles and apron 164 safety equipment 168 hot water safety 172 safety tip for water testing 180 thermometer safety 182 heat safety 186 thermometer safety 192 heat safety 198 heat safety 200 safely using rubber bands

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ.06 Science	Process and Application	Demonstrate the ability to choose, construct, and/or assemble appropriate equipment for scientific investigations.	24 using an electronic timer 288 find the thickness of a single card	7 use a ruler to make a measurement 9 conduct three experiments with appropriate equipment 9 design three experiments and choose equipment 10 selecting ramp and photogates 12 using photogates 12 select equipment and set up experiment 14 using photogates 16 use a force scale 17 use photogates to study car on ramp 18 use a balance to find mass of car 30 rigging block and tackle 30 use force scale 44 using electrical meter 46 using electrical meter 48 using electrical meter 50 using electrical meter 86 use CPO Timer to measure frequency

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				107 study reflection of laser beam 108 study refraction of laser beam 113 trace critical angle with a laser beam 145 carry out procedure and select equipment 145 plan a procedure and select necessary equipment 151 plan procedures and select materials 151 select materials from list

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page	
INQ.07 Science	Process and Application	Apply critical and integrated science- thinking skills.	3	time measurement	vocabulary is presented in context of investigations
			5	make measurements with precision	4 difference between precise and accurate data
			6	scientists use metric units	5 making measurements with precision
			7	experimentation begins with a question	6 formulate hypothesis
			12	importance of reliable and accurate data collection	6 electronic timer and release technique
			19	design your own experiment	6 compare results with other groups
			20	explain your reasoning	7 design your own experiment
			20	how will speed change?	7 measure and record variables
			24	interpretations of patterns in data	7 record time interval
			24	predicting speed from a graph	9 present conclusions to the class
			27	how to read a graph	9 collect speed data
			27	reading a graph	9 design three experiments using car and ramp
			42	analyze a speed/distance graph	9 reporting on an experiment
			42	predict the speed of a car	9 devise a hypothesis
			42	devise an experiment	11 graph speed vs. position
			78	use and understand mass measurements	11 analyze speed change of car
			78	analyze lever diagram	
			280	measuring volume of liquids	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			280 measuring volume of solids	12 make metric length measurement 15 interpret a speed vs. time graph 16 decide how to vary the force on the car for this experiment 16 understand and use units of force 17 record times 17 measure the force 17 measure the force 18 study data table for relationship between force and motion 24 collect weight data 25 measure and record the force 25 analyze block and tackle data 26 what variables can be changed? 27 analyze lever equilibrium data 30 measure height difference 34 formulate hypothesis 35 does data support hypothesis?

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				<p>36 collect precise speed and height data</p> <p>36 make precise height measurements</p> <p>37 describe the flow of energy based on experimental graph</p> <p>39 give a brief presentation to the class</p> <p>41 drawing and interpreting circuit diagrams</p> <p>45 did battery voltage change?</p> <p>47 present and defend an explanation</p> <p>63 making measurements with precision</p> <p>75 collect mass and amplitude data</p> <p>75 make precise length measurements</p> <p>75 design pendulum experiment</p> <p>76 analyze pendulum data</p> <p>76 use data to predict best string length for a pendulum clock</p> <p>78 reading harmonic motion data tables and graphs</p>

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				93 decision trees and the advantage of doing multiple trials
				116 measuring mass
				117 measuring volume
				121 use graph to predict mass of six objects
				145 present findings to the class
				145 present findings and methods used
				146 record detailed observations
				147 students analyze chemical change lab results
				151 design experiment to find out if mass is conserved
				151 present results to the class
				156 make predictions about solubility
				166 devise hypothesis and explain
				166 what three factors influence dissolving rate?
				167 collect time data and record observations
				176 measure pH

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				178 formulate hypothesis
				198 formulate hypothesis

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ.08 Science	Process and Application	Use mathematical models, simple statistical models, and graphical models to express patterns and relationships determined from sets of scientific data.	11 controlling variables in experiments 19 did you run a controlled experiment? 20 what factors could explain the variability in their data? 24 making a graph 24 interpretations of patterns in data 26 creating graphs 27 reading a graph 41 make a graph 42 interpreting distance/time graph 42 analyze a speed/distance graph 78 analyze lever diagram	data tables and graphs can be created on computer or graphing calculator 6 compare results with other groups 7 what variables should be controlled? 9 construct a data table 11 graph speed vs. position 11 use your graph to predict speed 11 calculate % error 11 analyze speed change of car 12 understand and use data table 13 graph distance vs. time 15 interpret a speed vs. time graph 15 construct a quantitative graphical model 17 record results in data table 18 study data table for relationship between force and motion 18 organize different combinations of data

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				21 think about percent change
				24 use data table to record results
				25 create a mathematical model
				25 analyze block and tackle data
				27 use data table to record results
				27 analyze lever equilibrium data
				27 find math rule for lever equilibrium
				28 derive a math formula
				30 record ropes and pulley data in table
				35 does data support hypothesis?
				36 organize data into a table
				37 organize data into a graph of speed vs. height
				45 did battery voltage change?
				51 graph voltage vs. current
				75 create data table for self-designed experiment
				76 analyze pendulum data

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				76 calculate % error 121 graph mass vs. volume 129 control the height of the liquid 129 find average velocity 147 students analyze chemical change lab results 147 organize observations into a category table 151 does your experiment agree with law of conservation of mass? 151 design a data table 165 why was plain water tested? 165 what does the word "control" mean? 167 use data table for observations 167 average dissolving rate 173 organize water quality data into a table 181 construct a graphical model 183 construct a temperature vs. time graph

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INQ.09 Science	Process and Application	Solve for unknown quantities by manipulating variables simultaneously.	42	interpreting distance/time graph	25	create a mathematical model
					27	find math rule for lever equilibrium
					28	derive a math formula

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INQ.10 Science	Process and Application	Use written and oral communication skills to present and explain scientific phenomena and concepts individually or in collaborative groups using technical and non-technical language.	20	explain your reasoning	vocabulary is presented in context of investigations
			27	how to read a graph	9 present conclusions to the class
					9 reporting on an experiment
					15 discuss and test ideas with your group
					19 explain how you arrived at your answer
					29 discuss what you learned about gears
					37 describe the flow of energy based on experimental graph
					39 give a brief presentation to the class
					41 drawing and interpreting circuit diagrams
					47 discuss an explanation with your group
					47 present and defend an explanation
					78 reading harmonic motion data tables and graphs
					129 explain your answer and justify
					145 present findings to the class

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				145 present findings and methods used 151 present results to the class 173 write pragraph to explain results 175 create water quality report 179 write summary of findings
INQ.11 Science	Process and Application	Choose appropriate technology to retrieve relevant information from the Internet such as electronic encyclopedias, indices, and databases.	110 research Franklin's electricity experiments 370 research Lavoisier's contributions 400 research the Clean Air Act of 1970 and 1990 434 research local water supply history 464 research the history of heat and temperature	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ.12 Science	Process and Application	Analyze the advantages and disadvantages of widespread use of and reliance on technology.	73 relationship between science and technology 333 problems with disposing of plastics 355 recycling tires 356 recycling discarded tires 368 limiting reactants 379 research fuel cells 379 research economic impact of fuel cells 379 hydrogen-powered cars and the environment 392 storage of nuclear waste 395 fossil fuels 400 economic impact of pollution 400 economic impact of reducing air pollution 444 acid rain explained 448 research economic impact of producing gases that cause acid rain 448 research the issue of acid rain	70 using engineering design cycle 163 economic impact of end- product of combustion reaction 163 too much CO2 178 investigate effect of acid rain on microorganisms

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ.13 Science	Process and Application	Practice responsible use of technology systems, information, and software such as following copyright laws.		data tables and graphs can be created on computer or graphing calculator
INQ.14 Science	Process and Application	Evaluate technology-based options for lifelong learning.	110 research Franklin's electricity experiments 370 research Lavoisier's contributions 400 research the Clean Air Act of 1970 and 1990 434 research local water supply history 464 research the history of heat and temperature	

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INQ.15 Science	Process and Application	Identify the effects of technology on daily life.	135 circuit board explained 333 problems with disposing of plastics 355 recycling tires 356 recycling discarded tires 364 petroleum 368 limiting reactants 379 hydrogen-powered cars and the environment 379 research environmental impact of fuel cells 379 research fuel cells 379 research fuel cells 379 research economic impact of fuel cells 392 storage of nuclear waste 395 fossil fuels 400 economic impact of reducing air pollution 400 problems caused by airborne pollutants 400 economic impact of pollution 421 wise use of water 425 water cycle and conservation	163 economic impact of end- product of combustion reaction 163 too much CO2 163 consider a vehicle's fuel economy 163 research how trees offset accumulation of CO2 163 can trees compensate for manmade CO2 from vehicles and industry? 172 save water for houseplants 172 perform water quality tests 174 wise use of water supply 175 maintaining water supply quality 178 investigate effect of acid rain on microorganisms

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			430 water usage and quality 444 acid rain explained 448 research the issue of acid rain 448 research economic impact of producing gases that cause acid rain	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ.16 Science	Process and Application	Collect data and construct and analyze graphs, tables, and charts using tools such as computer-based or calculator-based probeware.	5 measuring distance 12 importance of reliable and accurate data collection 24 using an electronic timer 24 making a graph 24 interpretations of patterns in data 26 creating graphs 27 reading a graph 41 make a graph 42 interpreting distance/time graph 78 analyze lever diagram	data tables and graphs can be created on computer or graphing calculator 4 difference between precise and accurate data 5 measuring metric and english lengths 6 measure time 6 electronic timer and release technique 7 record time interval 9 construct a data table 9 collect speed data 12 using photogates 12 understand and use data table 13 graph distance vs. time 14 record three different time intervals 14 using photogates 15 construct a quantitative graphical model 15 interpret a speed vs. time graph 16 measure force 17 record times

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				17 record results in data table
				17 use photogates to study car on ramp
				18 organize different combinations of data
				24 use data table to record results
				24 collect weight data
				25 create a mathematical model
				25 collect force data
				27 use data table to record results
				27 find math rule for lever equilibrium
				27 write down the number of weights you use
				28 derive a math formula
				30 record ropes and pulley data in table
				36 organize data into a table
				36 collect precise speed and height data
				37 organize data into a graph of speed vs. height
				44 measure voltage
				46 measure current

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				48 measure resistance 51 graph voltage vs. current 75 create data table for self-designed experiment 75 collect mass and amplitude data 87 measure wavelength 116 measure mass 117 measure volume 121 graph mass vs. volume 147 organize observations into a category table 150 record data as you perform experiment 151 design a data table 167 use data table for observations 167 collect time data and record observations 173 organize water quality data into a table 180 measure temperature 181 construct a graphical model 183 construct a temperature vs. time graph

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.17 Physical Science	Properties and Changes in Matter	Trace the changing model of the atom from that of Democritus to the present quantum model.	313 development of atomic theory 324 research and create a poster to illustrate development of atomic model	130 investigate Rutherford's gold foil experiment
PS.18 Physical Science	Properties and Changes in Matter	Demonstrate use of the Bohr model.	311 location/size/charge of subatomic particles 311 protons/neutrons/electrons 315 atoms of same element have same atomic number 318 proton/electron attraction 324 use the periodic table to predict chemical formulas 324 which element is more likely to combine with other elements? 335 chemical bonding and the periodic table 388 showing valence electrons in a diagram	132 atomic number determines what element that atom is 132 building atom models 133 location of electrons in atom 133 protons and neutrons 136 ions 136 model stable and neutral atoms 137 importance of atomic number 137 build atomic models 140 find the number of electrons in outermost level 140 review subatomic particles 141 when an atom ionizes 141 modeling a chemical bond 143 ionic compounds

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page
PS.19 Physical Science	Properties and Changes in Matter	Differentiate between physical and chemical properties/changes.	294	development of Kevlar brand fiber	146 investigate and observe chemical and physical changes in the lab
			353	physical and chemical changes and digestion	
			355	physical and chemical changes in tire recycling	
			372	determine if changes are chemical or physical	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS.20 Physical Science	Properties and Changes in Matter	Demonstrate use of the periodic table for key purposes.	315	atomic number discussed	133	exploring isotopes
			316	mass number discussed	133	identify mass number
			316	isotopes explained	133	identify atomic number
			321	groups of elements and valence shells	133	identify element symbol and name
			321	studying the periodic table	136	understanding isotopes
			322	atomic number on the periodic table	136	mass number
			322	mass number on the periodic table	136	atomic number
			322	atomic mass on the periodic table	136	building and studying the periodic table
			322	chemical symbols and element names	141	build model of Na and Cl atoms and explain why they bond to form a molecule
			329	periodic table columns and valence electrons	142	arrangement of electrons and groups of elements
			330	ionic bonds	143	classify ionic compounds
			330	bonding and periodic table position	143	name chemical compounds
			331	covalent bonds	143	predict chemical formulas
			332	distinguishing between ionic and covalent bonds	145	determine empirical formula
			332	periodic table and electronegativities		
332	metals nonmetals and metalloids					

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			335 periodic table and oxidation numbers 336 writing a chemical formula 338 summary of chemical formula writing rules 339 naming compounds	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
PS.21 Physical Science	Properties and Changes in Matter	Classify matter according to characteristic properties.	284	melting and boiling point explained	116	mass and volume measurements
			284	melting and boiling points	119	melting point of ice
			285	table of melting and boiling points	124	build a density column
			291	density is independent of amount of substance	126	investigating buoyancy with clay boats
			291	density explained	128	use CPO viscometer to study viscosity
			292	hardness is a physical property of matter	143	ionic compounds
			292	elasticity is a physical property of matter	166	design experiments to explore dissolving rate
			293	brittleness is a physical property of matter	168	investigate solubility of sugar
			294	malleability is a physical property of matter	170	solubility and pressure
			294	tensile strength is a physical property of matter	170	solubility and temperature
			295	relationship between mass volume and density		
			296	density of liquid water vs. ice		
			297	buoyancy explained		
			298	sinking and floating		
			302	viscosity of motor oils		
			305	viscosity of glue mixtures		

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			332 metals nonmetals and metalloids 406 molecular motion and dissolving rate 406 molecular motion and dissolving rate 407 surface area and dissolving rate 411 effect of temperature on solubility 413 pressure and the solubility of gases 421 why water is a nearly universal solvent 423 polar solutes	
PS.22 Physical Science	Properties and Changes in Matter	Explain the formation of unsaturated, saturated, and supersaturated solutions.	406 molecular motion and dissolving rate 406 molecular motion and dissolving rate 407 surface area and dissolving rate 411 effect of temperature on solubility 413 pressure and the solubility of gases 421 why water is a nearly universal solvent 423 polar solutes	166 design experiments to explore dissolving rate 168 investigate solubility of sugar 170 solubility and pressure 170 solubility and temperature

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS.23 Physical Science	Properties and Changes in Matter	Describe the effects of factors that influence solubility and rate of solution.	406	molecular motion and dissolving rate	166	design experiments to explore dissolving rate
			406	molecular motion and dissolving rate	170	solubility and pressure
			407	surface area and dissolving rate		
			413	pressure and the solubility of gases		
			421	why water is a nearly universal solvent		
			423	polar solutes		
PS.24 Physical Science	Properties and Changes in Matter	Write simple formula and chemical word equations for the four basic types of reactions.	336	writing a chemical formula	143	name chemical compounds
			338	summary of chemical formula writing rules	143	predict chemical formulas
			339	naming compounds	145	determine empirical formula
			375	synthesis or addition reactions	156	investigate double displacement reactions
			376	decomposition reactions		
			377	double displacement reactions		
			377	single displacement reactions		
PS.25 Physical Science	Properties and Changes in Matter	Illustrate the Law of Conservation of Mass by balancing simple chemical equations.	371	which of the equations is balanced?	149	balance these equations
					150	investigate conservation of mass in effervescent tablet reaction

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.26 Physical Science	Properties and Changes in Matter	Describe factors that affect rates of reaction.	364 formation of petroleum is a very slow chemical reaction	156 predict products in a double displacement reaction
PS.27 Physical Science	Properties and Changes in Matter	Analyze the properties and interactions of acids and bases.	444 acid rain explained 448 research the issue of acid rain	176 measure pH 176 investigate acids and bases 178 investigate effect of acid rain on microorganisms
PS.28 Physical Science	Forces and Motions	Identify the basic natural forces.	106 electrical force is incredibly strong! 106 electrical forces 389 electromagnetic force 389 strong nuclear force 389 forces in the nucleus	136 strong force

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PS.29 Physical Science	Forces and Motions	Apply quantitative relationships and associated graphical representations among position, displacement, distance, time, speed, velocity, and acceleration.	14	how to calculate speed	8	calculating speed
			15	compare and contrast speed and velocity	9	collect data and calculate speed of car
			20	find speed of bumblebee	10	calculate speed of the car
			20	calculate speed of car	12	model the car's motion graphically
			24	accurate speed measurements	12	calculate speed of moving car
			29	position vs. time graph discussion	12	find speed of car at different positions
			30	position vs. time graphs	13	make a position vs. time graph
			32	average speed vs. instantaneous	14	calculate acceleration of car on ramp
			32	average speed discussed	14	acceleration is the rate at which speed changes
			33	understanding acceleration	14	calculate speed of car at two places on the ramp
			35	how to calculate acceleration	15	changes in motion can be represented graphically
			36	examples of acceleration	15	make a speed vs. time graph
			37	speed vs. time graph discussion	17	explore 2nd law and acceleration
			37	speed vs. time graphs	17	caclulate speed of car
			41	find acceleration of car	36	find speed of marble
			42	calculate speed from distance/time graph		
			49	link between force and acceleration		
			53	acceleration due to gravity		

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.30 Physical Science	Forces and Motions	Add parallel vector quantities (in the same or opposite directions) to determine a resultant.	51 net force explained	
PS.31 Physical Science	Forces and Motions	Describe relationships between force and motion in Newton's laws.	45 Newton's third law summarized 45 Newton's second law summarized 45 Newton's first law summarized 46 force has potential to change motion 48 Newton's first law in detail 49 force is related to acceleration 49 Newton's second law in detail 59 Newton's third law in detail 64 solving problems using $f=ma$	14 exploring acceleration on a ramp 16 2nd law 16 thinking about force 19 discover 2nd law of motion 19 find correct relationship between force mass and acceleration 20 force and motion with car and ramp 22 car and ramp and Newton's 3rd law 23 using 3rd law to explain common phenomena

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PS.32 Physical Science	Forces and Motions	Apply the quantitative relationships among force, distance, work, time, and power.	<p>68 compound machines</p> <p>83 how to calculate work</p> <p>85 efficiency explained</p> <p>85 efficiency and bicycles</p> <p>86 power explained</p> <p>86 how to calculate power</p> <p>87 concept of energy as stored work</p> <p>96 decide whether or not work is done</p> <p>96 calculate work done</p> <p>97 find the efficiency of a machine</p> <p>97 compare different amounts of work done</p> <p>97 calculate work accomplished by a motor</p> <p>97 calculate power</p> <p>97 analyze power of motor</p> <p>97 calculate power of two different machines</p> <p>97 calculate work output from efficiency data</p> <p>138 how to calculate electrical power</p> <p>488 work vs. calories used by the body</p>	<p>29 design and construct complex gear machines</p> <p>31 calculate work done on block</p> <p>31 work = force X distance</p> <p>185 find efficiency of water heater</p>

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			488 work vs. calories used by the body 491 work and mechanical systems	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
PS.33 Physical Science	Forces and Motions	Analyze the nature of simple machines.	67	how simple machines manipulate forces	25	discover mechanical advantage of ropes and pulleys
			69	how to calculate mechanical advantage	27	changing force and distance on a lever
			70	mechanical advantage of block and tackle	27	set up a lever that has mechanical advantage
			71	parts of a lever		
			71	how a lever works	30	exploring force and distance with ropes and pulleys
			71	the human body and simple machines		
			71	pliers as an example of a lever	31	work output vs. work input
			72	mechanical advantage of a lever	36	energy conservation and the roller coaster
			75	how gears work		
			78	set up a lever with MA greater than 1		
			78	design a toothbrush		
			79	analyze block and tackle		
			79	calculate mechanical advantage		
			79	analyze pulleys with different numbers of supporting strings		
			80	analyzing the jaw as a lever		
			80	analyze block and tackle machine on a sailboat		

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			80 analyze wheelbarrow 84 work input and output	
PS.34 Physical Science	Forces and Motions	Explain tradeoffs in the use of simple machines to do work.	67 how simple machines manipulate forces 70 mechanical advantage of block and tackle 71 the human body and simple machines 71 parts of a lever 72 mechanical advantage of a lever 75 how gears work 80 analyze block and tackle machine on a sailboat 80 analyzing the jaw as a lever	
PS.35 Physical Science	Forces and Motions	Apply quantitative relationships among force, area, and pressure in fluids.	299 Charles' law 300 Boyle's law 300 what is pressure?	

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
PS.36 Physical Science	Forces and Motions	Explain the relationships among mass, velocity, force, and momentum.	46	force has potential to change motion	16	unbalanced forces and acceleration of car
			47	weight vs. mass	19	discover 2nd law of motion
			49	force is related to acceleration	19	find correct relationship between force mass and acceleration
			51	net force explained		
			51	balanced and unbalanced forces	20	weight vs. mass
			60	how to calculate momentum	24	measure force in newtons
			64	calculate momentum		
			64	solving problems using $f=ma$		
			69	newtons and pounds		
			80	analyze the human jaw as a simple machine		

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.37 Physical Science	Interactions of Energy and Matter	Describe mathematically the relationships among potential energy, kinetic energy, and work.	83 how to calculate work 85 efficiency explained 85 efficiency and bicycles 87 concept of energy as stored work 91 following an energy transformation 96 calculate work done 97 find the efficiency of a machine 97 calculate work output from efficiency data 97 calculate work accomplished by a motor 97 compare different amounts of work done 488 work vs. calories used by the body 488 work vs. calories used by the body 491 work and mechanical systems	31 calculate work done on block 36 energy conservation and the roller coaster 38 identify potential/kinetic energy conversions 185 find efficiency of water heater
PS.38 Physical Science	Interactions of Energy and Matter	Explain phase changes in terms of the effect of energy on particle motion.	284 changes of state	119 create a temperature vs. time graph of phase change 119 energy and phase changes

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
PS.39 Physical Science	Interactions of Energy and Matter	Illustrate the law of conservation of energy.	88	potential and kinetic energy explained	36	energy conservation and the roller coaster
			90	conservation of energy explained	37	investigating conservation of energy with rollercoaster
			91	following an energy transformation	38	identify potential/kinetic energy conversions
			91	energy conversions	38	explore energy transformations
			92	energy transformations and conservation	38	conservation of energy and energy transformations
			93	different forms of energy described	38	specific heat and conservation of energy
			96	prove that energy is conserved	188	

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PS.40 Physical Science	Interactions of Energy and Matter	Explain methods of heat transfer.	468 heat transfer through air 468 densely packed solids are good conductors of heat 470 convection currents and weather 470 warming hands over candle 472 convection currents in water 476 solid road surface emits radiation 478 apply knowledge of heat transfer to different situations 481 global warming and heat transfer by radiation	190 investigate conduction through all states of matter 192 investigate convection in liquids 194 investigate radiation emitted by solids 194 investigate radiation emitted by liquids
PS.41 Physical Science	Interactions of Energy and Matter	Describe the transfer of energy through waves.	195 waves transmit energy 197 transverse and longitudinal waves 205 standing waves on a string 237 visible light and the electromagnetic spectrum 474 ultraviolet and infrared light 474 electromagnetic radiation 474 energy and radiation relationships	82 study wave pulses on elastic cord 84 make different types of waves in a ripple tank 134 investigating visible light with a spectrometer

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.42 Physical Science	Interactions of Energy and Matter	Identify wave characteristics.	179 what is a cycle? 182 concept of frequency explained 182 concept of period explained 192 analyze systems to find cycle/period/frequency 206 constructive and destructive interference 210 can wave interference sink a ship? 219 frequency of sound and pitch 221 importance of wavelength of sound waves 223 interference of sound waves 225 consonance and dissonance and beats 242 color and frequency of light waves	83 find speed of a wave 86 adjust frequency of a standing wave 90 what is sound and how do we hear it? 95 investigate interference with sound waves 105 explore relationship between color and wavelength

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS.43 Physical Science	Interactions of Energy and Matter	Relate physical properties of sound and light to wave characteristics.	206	constructive and destructive interference	90	investigate human perception of sound
			210	can wave interference sink a ship?	90	investigate human perception of sound
			213	how the ear works	90	what is sound and how do we hear it?
			217	loudness and decibels	94	does sound behave like other waves?
			219	frequency of sound and pitch	95	investigate interference with sound waves
			220	voice recognition programs	98	investigate sound and music
			220	white noise	101	observing white light through diffraction grating
			222	effect of temperature on speed of sound wave	104	investigate RGB model of color
			222	effect of medium on speed of sound wave	105	explore relationship between color and wavelength
			223	interference of sound waves	134	investigating visible light with a spectrometer
			225	consonance and dissonance and beats		
			226	musical instruments		
			237	visible light and the electromagnetic spectrum		
			242	color and frequency of light waves		
			243	RGB model of color		

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
			245 we see color in terms of reflected light 264 human eye as an optical instrument	
PS.44 Physical Science	Interactions of Energy and Matter	Analyze interactions of light and matter.	258 refraction in optical systems 258 forming images with lenses 260 reflection and mirrors 263 index of refraction 263 index of refraction 273 find the angle of reflection 476 absorption and emission	106 tracing incident and reflected rays 107 investigate how light interacts with mirrors 107 plot reflected rays from a mirror 107 investigate reflection of light 108 tracing incident and refracted rays 108 investigate how light interacts with a prism 108 explore refraction with lenses 110 finding focal point and focal length of a lens 111 plotting images formed when light is refracted by a lens

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.45 Physical Science	Interactions of Energy and Matter	Describe characteristics and behavior of static charge.	105 charge is a fundamental property of matter 106 static charge discussed 107 explanation of coulomb 108 how an electroscope works 108 electroscopes 121 electrical conductivity explained 171 electromagnetic induction explained	42 investigate electric charge 49 conductivity of aluminum vs. copper 73 exploring electric generators 73 use magnetic induction to create an electric field
PS.46 Physical Science	Interactions of Energy and Matter	Explain the relationship between electricity and magnetism.	164 what is an electromagnet? 166 increased current vs. strength of magnetic field 166 building an electromagnet 171 electromagnetic induction explained	66 build an electromagnet 67 find out what happens to strength of electromagnet when current is increased 73 exploring electric generators 73 use magnetic induction to create an electric field
PS.47 Physical Science	Interactions of Energy and Matter	Apply Ohm's law to electrical circuits.	131 Ohm's law explained 132 using Ohm's law to analyze circuits	50 Ohm's law

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Standard #: Core	Strand	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
PS.48 Physical Science	Interactions of Energy and Matter	Understand basic nuclear concepts.	387 fusion and fission explained 388 nuclear vs chemical reactions 393 carbon dating 393 radioisotopes in science and medicine 400 research pros and cons of nuclear technology	138 fusion and fission 138 nuclear reactions 160 radioactive decay 160 how do you simulate nuclear decay? 161 research pros and cons of uses for radioactive elements